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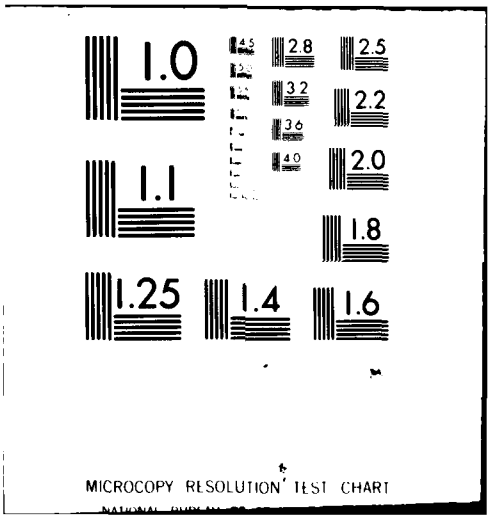
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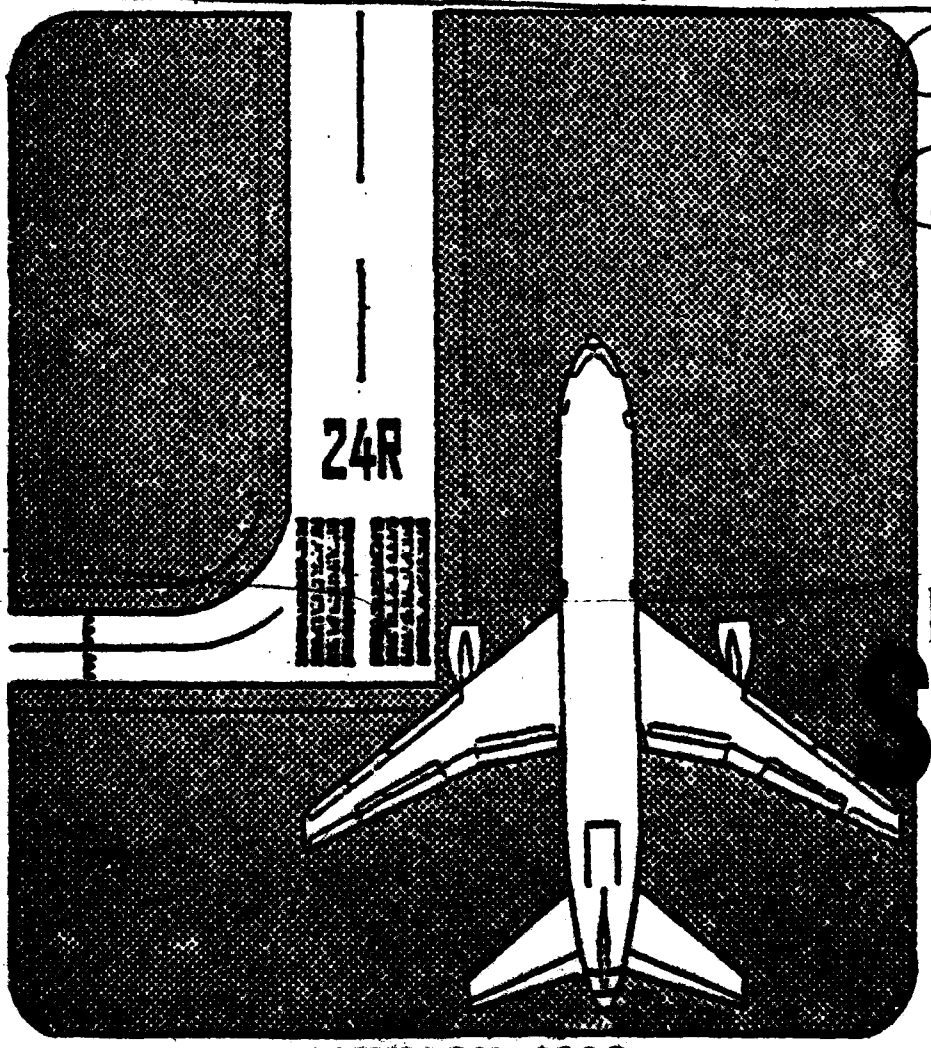
LOS ANGELES INTERNATIONAL AIRPORT

DATA PACKAGE NO. 8 AIRPORT IMPROVEMENT TASK FORCE DELAY STUDIES.



JANUARY 1980

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

NATIONAL AVIATION FACILITIES
EXPERIMENTAL CENTER
ATLANTIC CITY, NEW JERSEY 08405

DATE: January 30, 1980

IN REPLY REFER TO: ANA-220

SUBJECT: Los Angeles Simulation Model Results

FROM: Program Manager, ANA-220

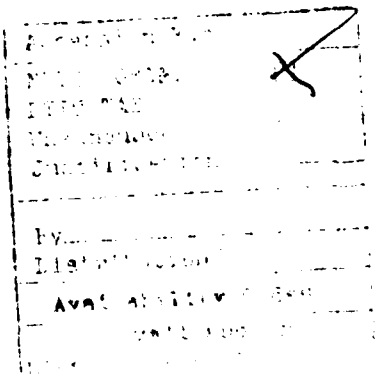
TO: Frank Jones, AWE-530

Enclosed is data package 8 for review by the Task Force members. Data package No. 7 was presented at the last meeting of the Task Force on December 19, 1979. At that time, a request was made to expand the night time over-ocean operation simulation into the heavy day time demand periods.

A basic premise for over-ocean operations was the insertion of a six minute gap every twenty minutes strickly for departure operations. Other suggested changes to the present day operation were to eliminate departure crossovers from north runways to the south, change the separation standards, adjust aircraft approach speeds, eliminate general aviation traffic from the mix using the primary runways and schedule aircraft precisely for the time intervals permitted for their operation. Most of the requests seem unreasonable and far beyound the range of possible recommendations by the task force.

Our approach was to conduct simulations for each proposed change beginning with the insertion of a six minute gap for departures, with existing operating conditions, then eliminat departure crossovers and adjust the approach speed along with the reduction of present day separation standards, etc.

The presentation of the results are limited to an extreme case where all the assumptions are inserted into the simulation with the exception of scheduling the demand to the time permitted for the desired operstion and excluding general aviation. Each simulation attempt resulted in a backlog of departures (nearly 150 operations) which clogged the simulation model storage and choked off the normal handling of arrivals and departures.



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Simple stated, the suggested expansion of the night time operation into the day time period under the assumed operating conditions did not produce enough departure capability to handle the airport demand. (The simulation model was run using a single random number seed to limit the cost of running the computer. Additional simulations can be performed with ten replications and increased model storage capacity.)

The final results of the simulation are shown in Attachment A, Table 1. The results can be compared with either Experiment No. 1 (1978 Demand with VFR weather for Easterly Flow) or Experiment No. 6 (1978 Demand with VFR weather for Westerly Flow) shown in Tables 2 and 3 ,respectively. Figure 1 gives a comparison with present day operations.

Attachment B contains the input and output for Experiments 17A,17B and 17C, employing the Runway Capacity Model. Assistance for this effort was provided by Galen Leek (OSEM) who performed the model runs and coordinated the inputs with ANA-220 and the LAX facility. The results indicate that the capacity of the specified configurations exceed the 1982 Demand, as shown in Figure 2.

Attachment C includes some additional work performed for the Stage 1 experiments. Experiment 5 and 10A were redone after correcting the original arrival-to-arrival separations which were originally set too high for the stated 1978 IFR-1 case. The correct results are shown in Figure 3.

Comparisons for travel times (arrival and departure) are shown in Figures 5 and 6 for VFR and IFR weather conditions. This type of data is as important to the study of the airport as average delays since it considers the effects of reassigning arrivals for the modified demand and rerouting departures from the south complex to the north runways. The effect of the improvements on travel times should be considered during the airport delay studies.

Attachment D contains the description of the Stage 2 experiments to be run for the LAX delay studies.

John VanderVeer

LIST OF TABLES

LIST OF FIGURES

ATTACHMENT A

LOS ANGELES DELAY EXPERIMENTS

NIGHT-TIME EXPANSION

LOS ANGELES INTERNATIONAL AIRPORT

AIRPORT IMPROVEMENT TASK FORCE DELAY STUDIES

TABLE 1

SUMMARY OF RESULTS

EXPERIMENT NO. 99

TIME	AVERAGE FLOW RATES: ARRIVALS RWY 6R	RWY 6L	RWY 7R	RWY 7L	AVG. TOTAL FLOW	DE-MAND	DIFF.	DEPARTURES RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	AVERAGE TRAVEL TIME: FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
7-8	2.0	11.0	10.0	6.0	29.0	29	0.0	16.0	3.0	7.0	11.0	37.0	48	-11.0	10.9	4.1	12.5
8-9	3.0	16.0	5.0	15.0	39.0	39	0.0	16.0	3.0	9.0	10.0	38.0	64	-26.0	10.4	4.8	31.5
9-10	2.0	12.0	14.0	10.0	38.0	40	-2.0	19.0	2.0	1.0	13.0	35.0	52	-17.0	10.6	5.4	96.9
10-11	1.0	13.0	14.0	16.0	48.0	50	-2.0	17.0	3.0	3.0	3.0	26.0	48	-22.0	11.0	8.0	67.5
11-12	1.0	10.0	16.0	5.0	32.0	59	-27.0	7.0	4.0	4.0	10.0	25.0	52	-27.0	11.7	20.3	101.9
12-13	0.0	3.0	6.0	3.0	12.0	45	-33.0	15.0	21.0	21.0	11.0	47.0	65	-18.0	11.7	7.5	99.1
13-14	1.0	0.0	0.0	1.0	2.0	42	-40.0	1.0	7.0	7.0	3.0	11.0	51	-40.0	4.3	4.5	99.0
14-15	0.0	0.0	0.0	0.0	0.0	47	-47.0	0.0	1.0	1.0	0.0	1.0	39	-38.0	0.0	0.0	23

TIME	ARRIVAL DELAYS AVERAGE: RWY 6R	RWY 6L	RWY 7R	RWY 7L	ALL RWY	RWY CROSS	TAXI-IN	DEPARTURE DELAYS AVERAGE: RWY 6R	RWY 6L	RWY 7R	RWY 7L	ALL RWY	RWY CROSS	TAXI-OUT	RWY CONG.	GRAND TOTAL: ARR. DELAY	DEP. DELAY
7-8	0.0	0.7	0.0	0.7	0.4	0.1	0.0	5.5	1.3	6.1	7.6	5.9	0.0	0.9	0.0	0.5	6.7
8-9	0.1	1.5	1.0	0.7	1.1	0.1	0.5	21.5	9.0	11.9	32.1	21.0	0.0	3.6	0.8	1.7	25.5
9-10	0.0	0.5	0.8	0.3	0.6	0.0	1.4	33.1	5.3	0.4	36.9	32.0	0.0	3.1	2.3	2.0	42.4
10-11	0.0	0.2	0.9	1.5	0.7	0.1	4.0	31.7	17.1	18.9	67.3	34.6	0.0	0.5	19.1	5.0	62.1
11-12	2.2	0.9	2.0	0.2	1.4	0.0	15.8	52.1	35.3	26.0	105.0	66.4	0.0	6.9	21.8	17.2	97.0
12-13	0.0	0.0	2.2	2.5	1.7	0.0	3.2	18.0	0.0	24.3	86.3	37.2	0.0	17.7	40.5	5.0	47.7
13-14	0.5	0.0	0.0	0.0	0.3	0.0	0.0	3.9	0.0	26.8	61.7	34.2	0.0	15.8	16.9	0.3	94.1
14-15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

* MODEL SIMULATION BEGAN LOSING ARRIVAL DEMAND DUE TO COMPUTER STORAGE OF AIRCRAFT SCHEDULE

TABLE 2

SUMMARY OF RESULTS

EXPERIMENT NO. 1

TIME	AVERAGE FLOW RATES														AVERAGE TRAVEL TIME		
	ARRIVALS							DEPARTURES									
	RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
7-8	10.0	2.0	8.0	10.0	30.0	29	+1.0	4.0	16.0	13.0	8.0	41.0	48	-7.0	9.5	4.0	7.7
8-9	11.0	3.0	14.0	10.0	38.0	39	-1.0	2.2	21.2	18.5	8.0	57.9	64	-6.1	10.4	4.3	11.6
9-10	8.0	2.0	12.3	16.1	38.4	40	-1.6	4.5	26.3	22.4	3.4	56.6	52	+4.6	9.9	4.3	18.4
10-11	11.0	1.0	14.7	22.9	49.6	50	-0.4	3.5	19.8	19.8	8.3	49.0	48	+1.0	10.3	4.4	13.1
11-12	14.0	5.0	9.4	32.3	60.7	59	+1.7	7.8	13.1	13.1	12.1	48.8	52	-3.2	14.3	4.5	9.8
12-13	9.0	2.0	11.6	23.6	46.2	45	+1.2	4.0	12.8	12.8	15.7	55.4	65	-9.6	14.5	4.6	19.1
13-14	10.6	1.0	14.4	16.0	41.4	42	-0.6	3.0	18.7	18.7	16.2	59.1	51	+8.2	10.7	4.4	21.5
14-15	7.0	3.0	12.5	21.6	44.1	47	-2.9	9.0	19.2	17.2	5.9	43.4	39	+4.4	11.9	4.4	10.8

TIME	ARRIVAL DELAYS AVERAGE							DEPARTURE DELAYS AVERAGE								GRAND TOTAL	
	RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-IN	RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-OUT	RWY CONG.	ARR. DELAY	DEP. DELAY
7-8	0.3	0.1	0.1	0.1	0.2	0.4	0.1	0.7	1.5	0.9	1.5	1.3	0.0	0.3	0.0	0.7	1.6
8-9	0.7	0.1	0.3	0.4	0.4	0.1	0.0	1.8	5.5	6.3	1.0	5.4	0.0	0.1	0.0	0.5	5.5
9-10	0.2	0.0	0.4	1.0	0.6	0.0	0.1	1.6	12.2	12.3	2.0	10.6	0.0	0.2	0.2	0.7	11.0
10-11	0.4	0.0	0.8	1.9	1.2	0.1	0.1	0.9	2.9	10.0	3.7	5.9	0.0	0.3	0.1	1.4	6.3
11-12	0.2	0.1	0.9	2.9	2.1	0.1	0.1	1.2	1.5	2.6	9.6	5.8	0.0	0.2	0.0	2.1	4.0
12-13	0.1	0.0	0.9	2.5	2.0	0.1	0.1	2.7	3.2	13.2	10.3	7.5	0.2	0.5	0.1	5.5	8.1
13-14	0.6	1.2	0.1	1.7	1.1	0.1	0.1	1.9	3.6	21.8	10.8	12.7	0.0	1.0	0.3	1.3	14.0
14-15	1.2	0.1	1.2	4.1	2.5	0.1	0.0	0.7	0.7	9.5	1.9	4.2	0.0	0.3	0.5	2.6	5.0

12/15/72

TABLE 3

SUMMARY OF RESULTS

EXPERIMENT NO. 6 (MODIFIED DEMAND)

TIME	AVERAGE FLOW RATES													AVERAGE TRAVEL TIME		
	ARRIVALS							DEPARTURES								
	RWY 6R	RWY 6L	RWY 7R	RWY 7L	AVG. TOTAL FLOW	DE-MAND	DIFF.	RWY 6R	RWY 6L	RWY 7R	RWY 7L	AVG. TOTAL FLOW	DE-MAND	DIFF.	FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
7-8	2.0	11.0	10.0	7.0	30.0	29	+1.0	16.0	4.0	8.0	13.0	41.0	48	-7.0	10.1	4.3	7.0
8-9	3.0	16.0	5.0	14.0	38.0	39	-1.0	29.0	2.0	8.0	17.9	56.9	64	-7.1	10.1	4.7	12.8
9-10	2.0	12.0	13.9	11.9	39.8	40	-0.2	27.9	5.0	3.1	20.2	56.2	52	+4.3	10.4	4.5	17.8
10-11	1.0	15.0	18.2	14.1	48.3	50	-1.7	16.1	3.6	7.5	21.2	48.4	46	+0.4	11.0	4.9	17.7
11-12	5.0	22.0	25.1	8.2	61.1	59	+2.1	15.8	7.2	14.2	14.6	51.8	52	-0.2	14.2	4.3	11.6
12-13	2.0	16.6	17.0	10.8	45.8	45	+0.8	23.0	4.2	16.5	13.0	56.7	65	-7.3	12.3	4.7	14.3
13-14	1.0	13.0	13.9	13.9	41.8	42	-0.2	20.8	2.9	14.3	17.8	55.8	57	+1.8	10.0	5.8	21.1
14-15	3.0	19.0	15.1	9.1	46.2	47	-0.8	9.9	8.9	6.3	20.1	45.2	39	+6.2	11.0	4.4	12.3

TIME	ARRIVAL DELAYS AVERAGE							DEPARTURE DELAYS AVERAGE								GRAND TOTAL	
	RWY 6R	RWY 6L	RWY 7R	RWY 7L	ALL RWY	RWY CROSS	TAXI-IN	RWY 6R	RWY 6L	RWY 7R	RWY 7L	ALL RWY	RWY CROSS	TAXI-OUT	RWY CONG.	ARR. DELAY	DEP. DELAY
7-8	0.1	0.3	0.2	0.0	0.2	0.0	0.2	0.8	0.0	1.5	1.6	1.1	0.0	0.4	0.0	0.4	1.5
8-9	0.3	1.9	0.2	0.2	0.7	0.0	0.2	6.7	1.2	3.2	8.3	6.5	0.0	0.5	0.1	0.9	7.1
9-10	0.0	0.4	0.9	0.4	[illegible]	0.1	0.3	9.1	5.1	1.9	15.2	10.7	0.0	1.0	0.8	0.1	12.5
10-11	0.3	0.3	1.5	0.9	0.9	0.1	0.6	1.6	1.7	3.9	16.1	8.3	0.0	2.0	2.3	1.6	12.6
11-12	0.3	0.7	7.8	0.5	3.7	0.1	0.2	1.4	1.5	13.2	4.0	5.4	0.0	1.1	0.1	4.0	6.6
12-13	0.1	0.7	3.5	0.6	1.7	0.2	0.4	5.9	2.9	7.9	13.0	7.7	0.0	1.3	0.3	2.3	9.3
13-14	1.4	0.5	1.0	0.6	0.7	0.2	1.6	1.9	2.8	10.4	19.9	9.8	0.0	1.2	2.0	2.5	16.0
14-15	0.8	0.4	0.6	1.1	0.6	0.1	0.3	0.8	1.2	2.2	7.9	4.3	0.0	1.0	1.8	1.0	7.1

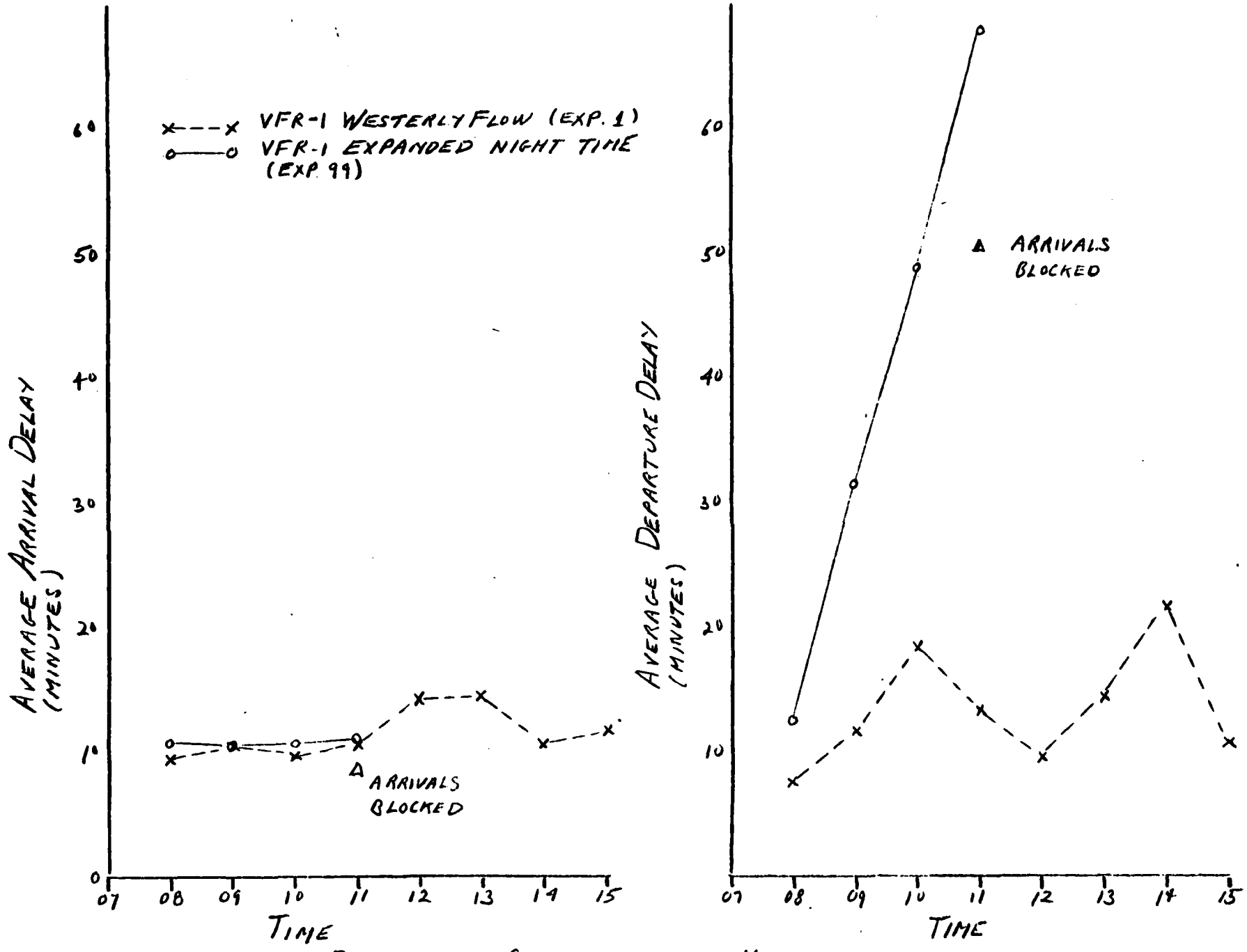

FIGURE 1 COMPARISON OF NORMAL OPERATIONS WITH EXPANDED NIGHT TIME OPERATIONS

ATTACHMENT B

LOS ANGELES CAPACITY EXPERIMENTS

EXPERIMENTS 17A, 17B and 17C

1982 AIRFIELD CAPACITY

INPUTS, RESULTS AND ANALYSIS

LOS ANGELES INTERNATIONAL AIRPORT

AIRPORT IMPROVEMENT TASK FORCE DELAY STUDIES

CAPACITY INPUT

Weather:

VFR -- Ceiling at least 2,500 feet
-- Visibility at least 3 miles

Airfield Mix (1982 demand - peak hours):

%A	%B	%C	%D
5	19	55	21

Percent Arrivals:

40%, 45%, 50%, 55%, 60%

Percent Touch-and-Go:

0%

Airspace Restriction:

None

Airfield Restriction:

No Class D departures on 25L.
No noise restrictions on 24R as such, but noise is reduced when 24R is used only for arrivals.

Common Approach Path Length (nautical miles):

A	B	C	D
2	2	6	6

Approach Speed (gound speed in knots):

A	B	C	D
100	120	130	140

Arrival/Arrival Separations (minutes) -- 1982 VFR -- from 78-8A:

Lead Aircraft Class	TRAIL AIRCRAFT CLASS A	B	C	D
A	1.9	1.9	1.9	1.9
B	1.9	1.9	1.9	1.9
C	2.7	2.7	1.9	1.9
D	4.0	4.0	3.0	2.7

Departure/Departure Separations (seconds) -- 1982 VFR -- from 78-8A:

Lead Aircraft Class	TRAIL AIRCRAFT CLASS A	B	C	D
A	35	35	45	50
B	35	35	45	50
C	50	50	60	60
D	120	120	120	90

Arrival Runway Occupancy Times (seconds) -- derrived from field data
-- standard deviation is 6 seconds

	A	B	C	D
25L	43	45	45	45
24L	35	35	39	50
24R	38	39	56	52

Departure Runway Occupancy Times (seconds) -- derrived from field data
-- standard deviation is 4 seconds

A	B	C	D
34	34	39	39

NOTE -- Aircraft Classifications is as follows:

Class	
A	Small -- single engine and less than 12,500 lbs.
B	Small -- twin engine and less than 12,500 lbs., plus Lear jets
C	Large -- 12,500 lbs. to 325,000 lbs.
D	Heavy -- greater than 325,000 lbs.

1982 CAPACITY EVALUATIONS

Experiments 17A, 17B and 17C required that no Class D departures use the south complex because of the weight restriction imposed by the tunnel. That requirement was not a direct input into the model but it could easily be satisfied by the controller sending Class D departures to 24L. Twenty-one percent of the airfield mix were Class D aircraft. Only 12 percent of the airfield mix were Class D departures.

Experiment 17A

Experiment 17A called for mixed operations on all 3 runways (24R, 24L and 25R), 1982 demand and separations, restricted use of 25L by Class D departures and noise abatement restrictions on 25R. No airspace crossover restrictions were imposed.

On the initial capacity run for Experiment 17A, no noise restrictions were imposed. Mixed operations were permitted on all 3 runways (24R, 24L and 25L). The hourly capacity ranged from a low of 154 at 40% arrivals to a high of 157 at 60% arrivals. With 50% arrivals, the capacity was 155. See Table 4 and Figure 2.

Noise abatement procedures were desired in the north, but it was felt that they would be relaxed during the period of tunnel construction. Rerunning the capacity model with that in mind required a different runway configuration. Using 24R for arrivals, 24L for departures and 25L for mixed operations, the model was rerun. The largest hourly capacity was 146 at 40% arrivals and the smallest hourly capacity was 119 at 60% arrivals. With 50% arrivals, the hourly capacity was 132. See Table 5 and Figure 2.

The peak hourly demand for 1982 is 114; it is below all of the hourly capacity figures. The prime consideration here is the ratio of demand to capacity. Demand over capacity (i.e. D/C) should always be less than one. Computing demand over capacity for all of the arrival percentages yields the following results:

Capacity	D(=114)/C	% Arrivals
146	.78	40%
141	.81	45%
132	.86	50%
125	.91	55%
119	.96	60%

Since demand over capacity is always less than 1, it can be concluded that the peak 1982 demand can be met while observing reduced noise abatement procedures in the north complex and employing the weight restriction in the south complex. Use 24R for arrivals, 24L for departures, 25L for mixed operations, and send Class D departures to 24L. Always operate 25L at its capacity (55) and utilize the north complex only when nexessary. With no more than 55 operations per hour, the south side can handle all operations except Class D departures. When there are more than 55 operations, run 25L at its capacity and accomadate other operations on the north complex.

Experiments 17B and 17C

Experiments 17 B and 17C called for mixed operations on all runways, restricted use of 25L by Class D departures, and noise restrictions on 24R. No airspace crossover restrictions were imposed. Experiment 17B utilized 24R,24L, 25R and 25L; only Class A and B aircraft were allowed to use 25R. Experiment 17C used runways 24R, 24L, 25L and 26.

The results of Experiment 17A show that runways 24R, 24L and 25L can handle the 1982 demand by themselves. Since 5% of the aircraft are small single-engine planes (Class A), they can use the shorter runways exclusively -- runway 26 or the open part of 25R. Hence, this should increase the hourly capacity by approximately 5 percent.

% Arrivals	Capacity-3 Runways	5% Increase	Capacity- 4Runways
40%	146	7	153
45%	141	7	148
50%	132	7	139
55%	125	6	131
60%	119	6	125

Operating with 60% arrivals on the 4 runways gives the lowest capacity, 125. With the peak hour demand of 114, the demand over capacity ratio is still less than one. Hence, peak demand can always be met in Experiments 17B and 17C.

For Experiments 17B and 17C, use 24R for arrivals, 24L for departures and the runways on the south complex for mixed operations. Operate the south complex at capacity while accomadating the other aircraft on the north complex when necessary. Runway 26 and the shortened runway 25R should be used only for Class A operations. Class D departures should use 24L. Operating in this fashion will enable the demand to be met while operating with relaxed noise abatement procedures.

TABLE 4

1982 VFR CAPACITY RESULTS -- NO NOISE CONSTRAINTS

24R, 24L and 25L -- MIXED OPERATIONS

NO NOISE RESTRICTIONS

Because of mixed operations on both runways on the north complex, there is an estimated 5% departures capacity loss due to crossover departure paths on the ground. The departure capacity was 35 for the north complex for all arrival percentages (40%, 45%, 50%, 55%, 60%). A 5% departure capacity loss (2 departures) resulted in a departure capacity of 33 on the north complex.

	Hourly Capacity By % Arrivals				
Runways	40%	45%	50%	55%	60%
24R, 24L	99	100	100	101	102
25L	55	55	55	55	55
All 3 Runways	154	155	155	156	157

TABLE 5

1982 VFR CAPACITY RESULTS -- RELAXED NOISE CONSTRAINTS

24R -- ARRIVALS
24L -- DEPARTURES
25L -- MIXED OPERATIONS

The relaxed noise restrictions were the result of running on arrivals on 24R.

Runways	Hourly Capacity By % Arrivals 40%	45%	50%	55%	60%
24R, 24L	91	86	77	70	64
25L	55	55	55	55	55
All 3 Runways	146	141	132	125	119

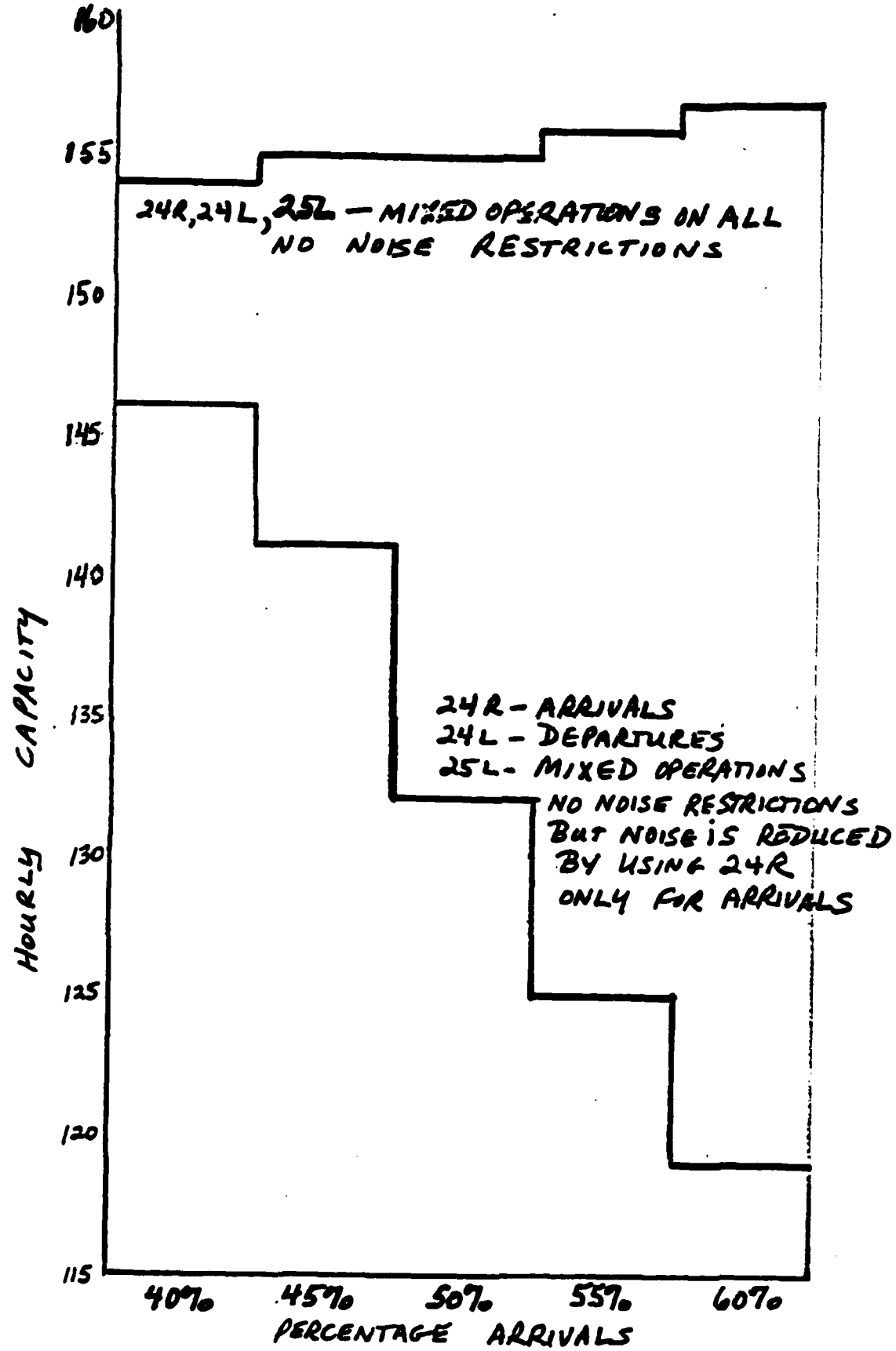

FIGURE 2. Comparison of 1982 VFR Capacity Results

ATTACHMENT C

RESULTS of LAX STAGE 1 DELAY EXPERIMENTS

LOS ANGELES INTERNATIONAL AIRPORT

LOS ANGELES

AIRPORT IMPROVEMENT TASK FORCE DELAY STUDIES

LAX - STAGE 1

EXPERIMENT NO. 5

Objective:

To obtain baseline delay estimates for the following runway configuration in IFR1 for 1978 demand.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
6R, 7L	24L, 25R

Related Comparison Experiments:

Experiment # 10A is identical except for the 1982 demand.

(NEW)

TABLE 6

SUMMARY OF RESULTS

EXPERIMENT NO. 5 (MODIFIED DEMAND)

TIME	AVERAGE FLOW RATES														AVERAGE TRAVEL TIME		
	ARRIVALS							DEPARTURES									
	RWY 6R	RWY 7L	RWY 24L	RWY 25R	AVG. TOTAL FLOW	DE-MAND	DIFF.	RWY 6R	RWY 7L	RWY 24L	RWY 25R	AVG. TOTAL FLOW	DE-MAND	DIFF.	FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
0-1	13.3	0.0	0.0	0.0	13.3	19	-5.7	0.0	0.0	9.7	7.8	17.5	24	-6.5	15.0	5.7	13.5
1-2	15.8	0.0	0.0	0.0	15.8	18	-2.2	0.0	0.0	5.5	8.7	14.2	19	-4.8	33.6	5.5	22.7
2-3	15.1	0.0	0.0	0.0	15.1	14	+1.1	0.0	0.0	8.7	6.3	15.0	9	+6.0	48.3	5.7	23.3
3-4	11.8	0.0	0.0	0.0	11.8	5	+6.8	0.0	0.0	5.7	2.2	7.9	4	+3.9	25.7	5.6	23.7
4-5	10.0	0.0	0.0	0.0	10.0	10	0.0	0.0	0.0	3.4	5.0	8.4	7	+1.4	11.1	5.7	12.3
5-6	7.0	0.0	0.0	0.0	7.0	7	0.0	0.0	0.0	2.9	3.7	6.6	10	-3.4	11.3	4.5	5.3
6-7	13.0	0.0	0.0	0.0	13.0	16	-3.0	0.0	0.0	9.1	9.8	18.9	17	+1.9	14.5	5.2	21.9
7-8	6.0	0.0	0.0	0.0	6.0	29	-23.0	0.0	0.0	12.5	21.6	34.1	48	-13.9	35.1	6.3	17.5

TIME	ARRIVAL DELAYS AVERAGE							DEPARTURE DELAYS AVERAGE								GRAND TOTAL	
	RWY 6R	RWY 7L	RWY 24L	RWY 25R	ALL RWY	RWY CROSS	TAXI-IN	RWY 6R	RWY 7L	RWY 24L	RWY 25R	ALL RWY	RWY CROSS	TAXI-OUT	RWY CONG.	ARR. DELAY	DEP. DELAY
0-1	3.8	0.0	0.0	0.0	3.8	0.0	0.2	0.0	0.0	8.7	3.3	6.3	0.0	0.2	0.0	4.0	6.5
1-2	22.7	0.0	0.0	0.0	22.7	0.0	0.2	0.0	0.0	21.5	15.1	17.6	0.0	0.1	0.0	22.8	17.7
2-3	38.9	0.0	0.0	0.0	38.9	0.0	0.0	0.0	0.0	18.0	15.4	17.6	0.0	0.0	0.0	38.9	17.6
3-4	15.5	0.0	0.0	0.0	15.5	0.0	0.0	0.0	0.0	18.2	14.9	17.4	0.0	0.1	0.0	15.5	17.4
4-5	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	7.9	4.9	6.1	0.0	0.0	0.0	0.4	6.1
5-6	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.2	0.2
6-7	4.9	0.0	0.0	0.0	4.9	0.0	0.0	0.0	0.0	18.3	14.9	16.3	0.0	0.0	0.0	4.9	16.3
7-8	25.5	0.0	0.0	0.0	25.5	0.0	0.3	0.0	0.0	10.9	12.1	11.6	0.0	0.3	0.0	25.6	11.9

LAX - STAGE 1

EXPERIMENT NO. 10A

Objective:

To obtain baseline delay estimates for the following runway configuration in IFR 1 for 1982 demand.

To obtain delay estimates for 1982 with no improvements to the airport.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
6R, 7L	24L, 25R

Related Comparison Experiments:

Prior Experiment 5 is similar with a 1978 demand.

TABLE 7

SUMMARY OF RESULTS

EXPERIMENT NO. 10A (MODIFIED DEMAND)

TIME	AVERAGE FLOW RATES														AVERAGE TRAVEL TIME		
	ARRIVALS							DEPARTURES									
	RWY 6R	RWY 7L	RWY 24L	RWY 25R	AVG. TOTAL FLOW	DE-MAND	DIFF.	RWY 6R	RWY 7L	RWY 24L	RWY 25R	AVG. TOTAL FLOW	DE-MAND	DIFF.	FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
0-1	12.0	0.0	0.0	0.0	12.0	19	-7.0	0.0	0.0	8.5	10.1	18.6	26	-7.4	11.1	5.4	17.0
1-2	12.1	0.0	0.0	0.0	12.1	22	-9.9	0.0	0.0	13.3	9.2	22.5	19	+3.5	51.1	5.7	18.9
2-3	18.4	0.0	0.0	0.0	18.4	13	+5.4	0.0	0.0	5.7	4.9	10.6	10	+0.6	58.5	5.3	29.9
3-4	15.5	0.0	0.0	0.0	15.5	4	+1.5	0.0	0.0	4.5	3.8	8.3	4	+4.3	45.4	5.2	32.3
4-5	10.0	0.0	0.0	0.0	10.0	9	+1.0	0.0	0.0	2.1	1.0	3.1	7	-6.9	11.8	5.4	7.1
5-6	9.8	0.0	0.0	0.0	9.8	9	+0.8	0.0	0.0	8.9	6.3	15.2	10	+5.2	14.0	5.5	17.0
6-7	14.3	0.0	0.0	0.0	14.3	16	-1.7	0.0	0.0	3.1	9.0	12.1	18	-5.9	15.0	5.4	18.0
7-8	4.2	0.0	0.0	0.0	4.2	25	-20.8	0.0	0.0	14.0	21.8	35.8	48	-12.2	35.4	5.5	21.0

TIME	ARRIVAL DELAYS AVERAGE							DEPARTURE DELAYS AVERAGE								GRAND TOTAL	
	RWY 6R	RWY 7L	RWY 24L	RWY 25R	ALL RWY	RWY CROSS	TAXI-IN	RWY 6R	RWY 7L	RWY 24L	RWY 25R	ALL RWY	RWY CROSS	TAXI-OUT	RWY CONG.	ARR. DELAY	DEP. DELAY
0-1	0.9	0.0	0.0	0.0	0.9	0.0	0.1	0.0	0.0	17.1	4.6	10.1	0.0	0.1	0.0	1.0	16.5
1-2	40.4	0.0	0.0	0.0	40.4	0.0	0.0	0.0	0.0	15.5	9.1	12.8	0.0	0.0	0.0	40.4	15.2
2-3	48.8	0.0	0.0	0.0	48.8	0.0	0.0	0.0	0.0	21.3	24.7	24.5	0.0	0.0	0.0	48.8	24.5
3-4	35.3	0.0	0.0	0.0	35.3	0.0	0.0	0.0	0.0	21.9	26.8	26.1	0.0	0.0	0.0	35.3	26.1
4-5	1.3	0.0	0.0	0.0	1.3	0.0	0.1	0.0	0.0	1.6	2.6	2.0	0.0	0.0	0.0	1.4	2.0
5-6	3.4	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0	13.3	7.7	11.0	0.0	0.5	0.0	5.4	11.3
6-7	3.9	0.0	0.0	0.0	3.9	0.0	0.1	0.0	0.0	12.6	10.4	12.4	0.0	0.5	0.0	4.0	12.8
7-8	26.6	0.0	0.0	0.0	26.6	0.0	0.2	0.0	0.0	15.1	15.6	16.3	0.0	1.1	0.2	26.1	15.5

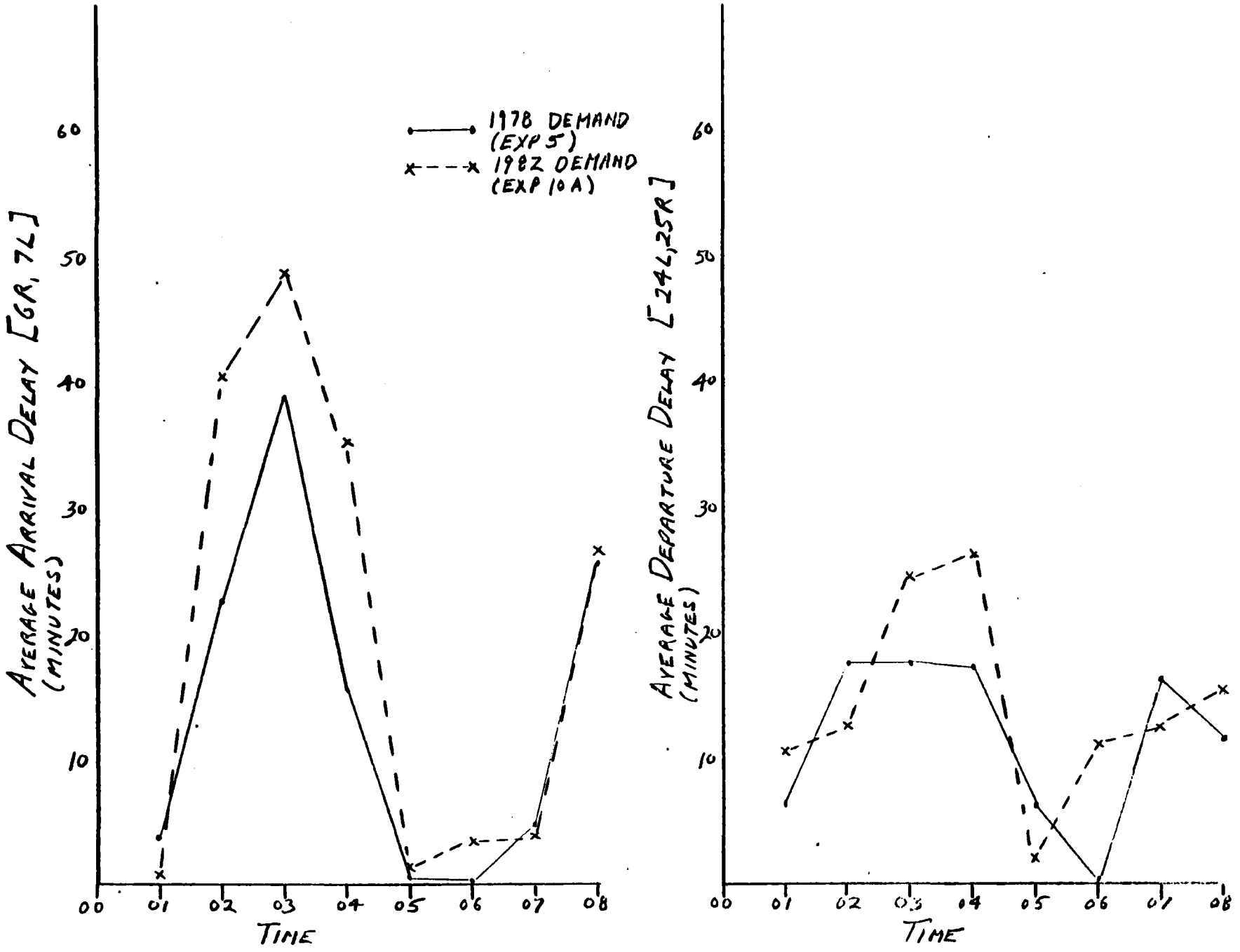

FIGURE 3 IFR-1 (1978) COMPARISON - NIGHT TIME

LAX - STAGE 1

EXPERIMENT NO. 7

Objective:

To obtain baseline delay estimates for the following runway configurations in VFR 1 for 1982 demand.

To obtain delay estimates for 1982 with no improvements to the airport.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25R, 25L	24R, 24L, 25R, 25L

Related Comparison Experiments:

Experiment 11 is similar with an improved ATC system scenario (1982) and the 1982 near-term improvements.

Prior Experiment 1 is similar for the 1978 demand.

12/3/79

TABLE 8

SUMMARY OF RESULTS

EXPERIMENT NO. 7

TIME	AVERAGE FLOW RATES: ARRIVALS RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DEMAND	DIFF.	DEPARTURES RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DEMAND	DIFF.	AVERAGE TRAVEL TIME: FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
7-8	2.0	1.0	6.0	18.0	27.0	25	+2.0	2.0	16.0	15.0	8.0	41.0	48	-7.0	9.7	4.7	7.4
8-9	10.0	1.0	14.0	17.0	44.0	45	-1.0	6.1	24.9	19.4	7.9	58.3	64	-5.7	10.5	4.7	13.9
9-10	6.1	1.0	15.0	18.0	40.0	41	-1.0	5.0	28.3	18.7	6.1	58.1	54	+4.1	10.7	4.1	16.8
10-11	11.0	3.0	13.2	25.3	52.5	53	-0.5	7.9	21.6	15.9	5.0	50.4	48	+2.4	11.5	4.6	13.1
11-12	12.0	3.0	22.5	21.5	59.0	62	-3.0	5.0	16.7	14.7	8.5	45.1	52	-6.9	12.0	4.6	10.3
12-13	12.0	1.0	11.4	23.0	47.4	44	+3.4	3.8	26.2	19.5	12.6	62.1	65	-2.9	12.6	4.5	17.4
13-14	8.0	2.0	9.6	20.1	39.7	40	-0.3	5.2	24.1	14.6	15.2	59.1	54	+5.1	10.6	4.5	16.1
14-15	10.0	5.0	13.3	23.6	51.9	53	-1.1	5.1	12.5	14.8	11.5	43.9	41	+2.9	10.5	4.4	9.4

TIME	ARRIVAL DELAYS AVERAGE: RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-IN	DEPARTURE DELAYS AVERAGE: RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-OUT	RWY CONG.	GRAND TOTAL: ARR. DELAY	DEP. DELAY
7-8	0.0	0.0	1.5	0.7	0.3	0.2	0.2	0.7	0.9	2.7	1.6	1.6	0.0	0.2	0.0	1.2	1.7
8-9	0.4	0.2	1.1	1.2	1.0	0.0	0.1	3.0	2.7	12.0	6.5	6.3	0.0	1.5	0.0	1.1	2.8
9-10	0.0	0.0	1.3	1.8	1.3	0.3	0.1	2.7	11.3	7.2	6.7	8.7	0.0	1.5	0.0	1.7	10.2
10-11	0.6	0.6	0.8	3.1	1.8	0.1	0.0	2.3	8.2	2.8	4.1	5.2	0.0	1.4	0.0	1.1	6.6
11-12	0.1	0.4	3.4	2.8	2.4	0.1	0.1	1.9	1.1	1.4	3.1	4.2	0.0	0.4	0.0	2.6	4.6
12-13	0.4	0.0	1.6	6.1	3.5	0.1	0.2	1.4	5.2	12.4	9.2	9.5	0.0	1.1	0.1	3.8	11.4
13-14	0.2	0.0	1.7	1.8	1.4	0.1	0.1	1.9	5.1	10.4	10.8	9.0	0.0	1.0	0.1	1.6	9.0
14-15	0.2	0.0	1.0	1.5	1.2	0.1	0.0	0.5	1.9	5.2	3.3	3.2	0.1	0.6	0.0	1.3	3.9

LAX - STAGE 1

EXPERIMENT NO. 11

Objective:

To assess delays to aircraft in 1982 for the following runway configuration in VFR 1 with an improved ATC system scenario (1982) and the 1982 near-term improvements.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25R, 25L	24R, 24L, 25R, 25L

Related Comparison Experiments:

Experiment 13 is identical less improvements #2 (high-speed taxiway off runway 25L) and improvements #3 (strengthening of the Sepulverda tunnel).

Prior Experiment 7 is similar without the noted improvements and a 1978 ATC system scenario.
Prior Experiment 1 is similar without the noted improvements and a 1978 demand and a 1978 ATC system scenario.

TABLE 9

SUMMARY OF RESULTS

EXPERIMENT NO. 11

TIME	AVERAGE FLOW RATES														AVERAGE TRAVEL TIME		
	ARRIVALS							DEPARTURES									
	RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
7-8	2.0	1.0	6.0	17.9	26.9	25	+1.9	2.0	13.0	16.0	10.0	41.0	48	-7.0	9.8	4.3	6.1
8-9	1.0	1.0	14.0	15.3	45.3	45	-1.7	2.3	14.0	25.0	10.7	51.7	64	-12.3	10.8	4.6	14.9
9-10	6.0	1.0	15.0	19.3	40.3	41	-0.7	4.6	23.0	25.2	7.0	59.8	54	+5.8	12.0	4.1	17.9
10-11	11.0	3.0	13.3	22.9	50.2	53	-2.8	4.1	11.0	19.8	11.6	46.5	48	-1.5	12.8	4.6	23.2
11-12	12.0	3.0	19.9	22.4	57.3	62	-4.7	2.0	16.0	18.0	12.8	48.8	52	-3.2	15.6	4.7	18.1
12-13	12.0	1.0	13.8	22.9	49.7	44	+5.7	1.0	15.7	20.6	11.6	48.9	65	-16.1	16.9	5.0	29.0
13-14	8.0	2.0	10.0	21.3	41.3	40	+1.3	4.0	17.3	25.7	9.5	56.5	54	+2.5	12.7	5.4	29.4
14-15	10.0	5.0	13.0	19.8	47.8	53	-5.2	4.3	6.7	22.7	10.9	44.6	41	+3.6	12.4	4.8	34.3

TIME	ARRIVAL DELAYS AVERAGE							DEPARTURE DELAYS AVERAGE								GRAND TOTAL	
	RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-IN	RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-OUT	RWY CONG.	ARR. DELAY	DEP. DELAY
7-8	0.0	0.0	2.5	0.3	0.9	0.1	0.1	0.0	0.2	1.7	1.6	1.1	0.0	0.0	0.0	1.1	1.1
8-9	0.3	0.9	1.0	2.0	1.2	0.1	0.1	0.2	0.2	13.7	5.1	5.1	3.0	0.6	0.3	1.4	9.0
9-10	0.0	0.0	2.4	3.9	2.1	0.1	0.1	0.7	2.1	18.0	6.7	9.2	0.0	0.3	0.5	2.9	10.0
10-11	0.5	0.4	1.2	5.7	3.0	0.1	0.1	0.6	1.2	18.9	17.6	12.1	0.0	0.9	0.6	3.2	13.6
11-12	0.1	0.5	7.1	9.2	6.1	0.1	0.1	1.9	0.7	19.7	8.8	9.7	0.0	1.1	0.4	6.3	11.2
12-13	0.3	0.0	5.8	12.8	7.7	0.1	0.3	0.8	0.5	27.6	6.3	15.1	0.0	0.5	0.8	8.1	14.7
13-14	0.2	0.0	1.1	6.3	3.6	0.1	1.2	2.7	1.1	23.2	7.6	12.4	0.0	1.5	1.8	4.9	15.7
14-15	0.2	0.1	4.1	4.7	3.0	0.1	0.3	0.2	0.2	27.6	10.1	16.6	0.0	1.7	3.7	3.4	21.7

12/3/11

TABLE 10

SUMMARY OF RESULTS

EXPERIMENT NO. 11 (REROUTED DEPARTURES TO 24R FROM 25R)

TIME	AVERAGE FLOW RATES: ARRIVALS RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DEMAND	DIFF.	DEPARTURES RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DEMAND	DIFF.	AVERAGE TRAVEL TIME: FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
7-8	2.0	1.0	6.0	18.0	27.0	25	+2.0	2.0	13.0	16.0	10.0	41.0	48	-7.0	9.4	4.4	6.2
8-9	10.0	1.0	14.0	18.7	43.9	45	-1.1	12.3	14.0	19.8	10.9	57.0	64	-7.0	10.2	4.5	12.6
9-10	6.3	4.0	15.0	18.1	40.1	41	+0.1	12.3	22.8	18.7	8.9	62.7	54	+8.7	10.5	4.2	11.7
10-11	14.0	3.0	14.1	26.0	54.1	53	+1.1	6.7	11.2	16.2	11.6	45.7	48	-2.3	11.0	4.6	11.2
11-12	12.0	3.0	22.9	21.4	59.3	62	-2.7	5.5	16.0	15.9	11.1	48.5	52	-3.5	11.3	4.5	10.5
12-13	12.0	1.0	10.0	22.6	45.6	44	+1.6	15.5	15.9	18.8	13.2	63.4	65	-1.6	10.5	4.6	14.6
13-14	8.0	2.0	10.0	20.0	40.0	40	0.0	10.7	17.1	18.5	12.4	58.7	54	+4.7	10.0	4.4	11.6
14-15	16.0	5.0	13.0	24.0	52.0	53	-1.0	5.3	6.8	20.6	8.6	41.3	41	+0.3	10.2	4.5	8.2

TIME	ARRIVAL DELAYS AVERAGE: RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-IN	DEPARTURE DELAYS AVERAGE: RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-OUT	GRAND TOTAL: RWY CONG.	ARR. DELAY	DEP. DELAY
7-8	0.0	0.0	1.2	0.3	0.5	0.2	0.1	0.0	0.2	1.6	1.4	1.0	0.0	0.3	0.0	0.6	1.3
8-9	0.1	0.3	0.6	0.6	0.6	0.0	0.0	3.9	0.5	8.5	6.6	5.1	0.1	3.0	0.0	0.6	7.1
9-10	0.0	0.0	1.2	1.5	1.1	0.3	0.2	11.8	2.9	7.2	5.6	6.4	0.0	1.7	0.0	1.6	8.1
10-11	0.4	0.4	0.9	2.3	1.4	0.1	0.0	2.7	1.5	5.7	5.7	4.3	0.0	1.7	0.0	1.5	6.0
11-12	0.1	0.4	1.8	3.5	1.6	0.3	0.2	3.1	6.8	7.4	5.3	4.3	0.0	0.7	0.0	2.1	5.0
12-13	0.3	0.0	0.9	2.4	1.5	0.2	0.1	8.6	1.2	12.9	6.5	7.5	0.0	1.1	0.0	1.8	8.7
13-14	0.2	0.0	1.1	2.1	0.8	0.2	0.1	10.3	3.3	5.0	3.4	5.5	0.0	0.3	0.0	1.1	6.3
14-15	0.2	0.0	1.3	1.2	0.9	0.3	0.1	0.6	0.2	4.1	2.1	2.1	0.1	0.4	0.0	1.3	3.2

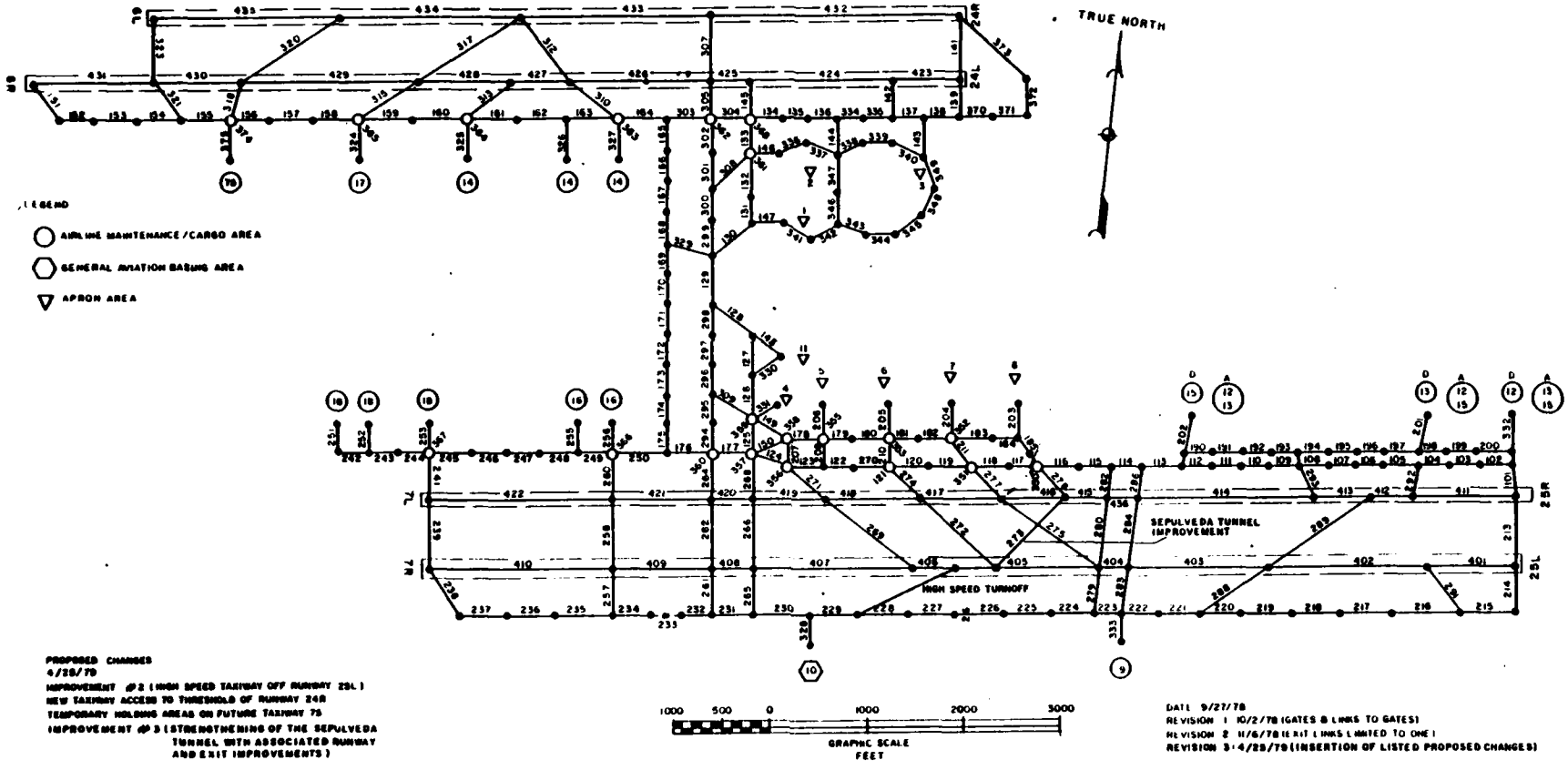

Figure 4 LAX LINK NODE DIAGRAM
(NEAR TERM IMPROVEMENTS)

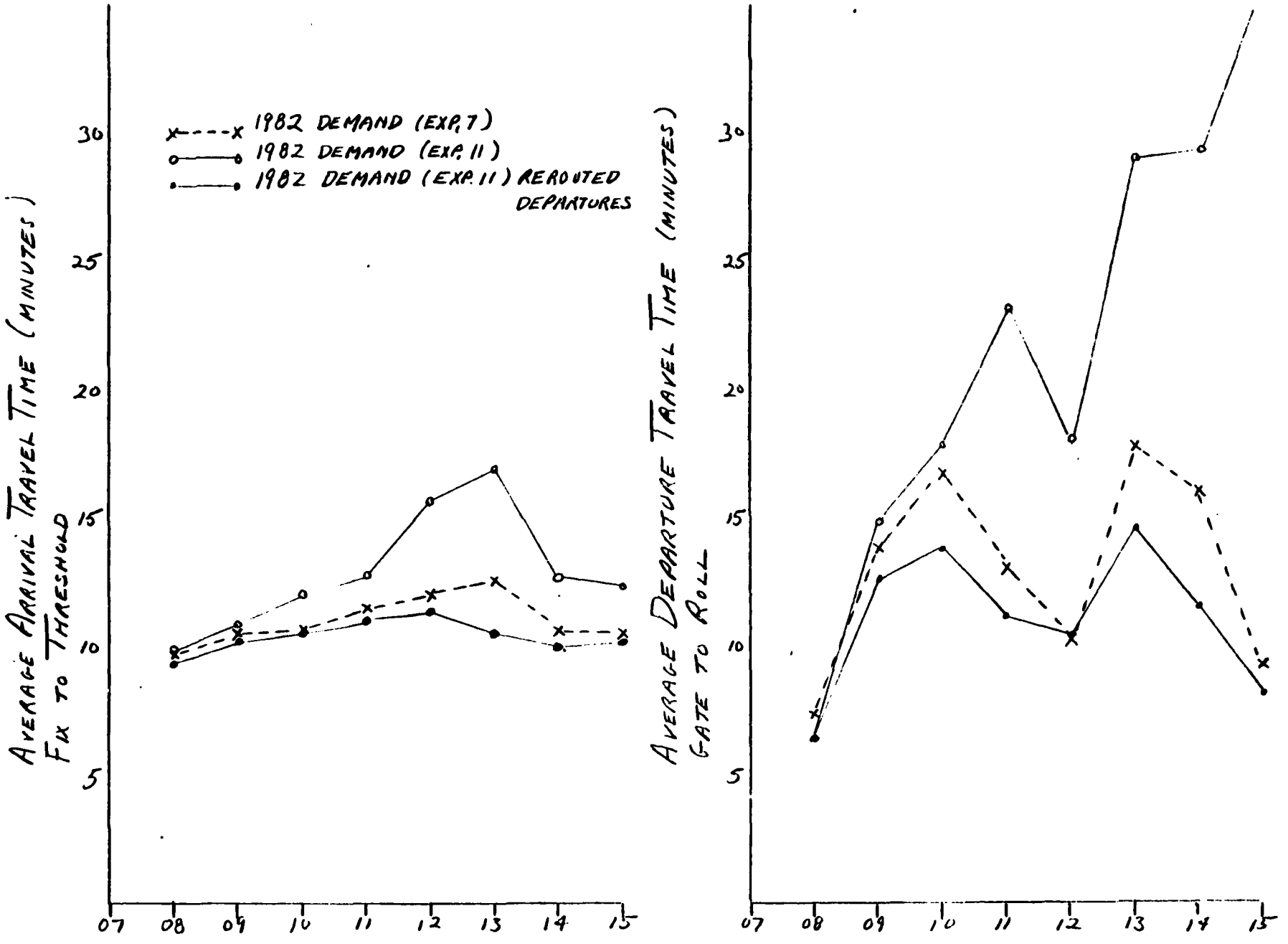

FIGURE 5 VFR (1978 AND 1982) COMPARISON - WESTERLY FLOW

LAX - STAGE 1

EXPERIMENT NO. 8

Objective:

To obtain baseline delay estimates for the following runway configurations in IFR 1 for 1982 demand.

To obtain delay estimates for 1982 with no improvements to the airport.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25R, 25L	24L, 25R

Related Comparison Experiments:

Experiment 12 is identical but with an improved ATC system (1982) scenario and the 1982 near-term improvements.

Prior Experiment #2 is identical except for a 1978 demand.

TABLE 11

SUMMARY OF RESULTS

EXPERIMENT NO. 8 (ALGORITHM PLANNED)

TIME	AVERAGE FLOW RATES														AVERAGE TRAVEL TIME		
	ARRIVALS							DEPARTURES									
	RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
7-8	4.0	0	0	22.0	26.0	25	+1.0	0	18.0	23.0	0	41.0	48	-7.0	12.2	4.1	7.4
8-9	20.0	0	0	24.1	44.1	45	-0.9	0	24.8	27.9	0	52.7	64	-11.3	13.9	4.6	14.7
9-10	8.0	0	0	25.5	33.5	41	-7.5	0	35.3	23.8	0	59.1	54	+5.1	17.9	4.4	12.8
10-11	20.0	0	0	29.0	49.0	53	-4.0	0	31.6	20.4	0	52.0	48	+4.0	20.9	4.7	19.0
11-12	25.4	0	0	27.4	52.8	62	-9.2	0	23.2	27.9	0	51.1	52	-0.9	26.1	4.7	9.1
12-13	24.2	0	0	26.1	50.3	44	+6.3	0	26.1	32.7	0	58.8	65	-6.2	35.7	4.7	12.0
13-14	14.5	0	0	25.1	39.6	40	-0.4	0	21.2	23.4	0	44.6	54	-9.4	30.1	4.6	14.8
14-15	21.1	0	0	26.5	47.6	53	-5.4	0	20.1	25.7	0	45.8	41	+4.8	29.5	4.7	9.0

TIME	ARRIVAL DELAYS AVERAGE							DEPARTURE DELAYS AVERAGE								GRAND TOTAL	
	RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-IN	RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-OUT	RWY CONG.	ARR. DELAY	DEP. DELAY
7-8	0.0	0	0	4.3	3.6	0.2	0.1	0	0.8	2.2	0	1.6	0.0	0.3	0.0	3.9	1.1
8-9	1.7	0	0	5.7	4.3	0.2	0.1	0	9.3	7.3	0	8.2	0.0	2.6	0.1	4.6	4.1
9-10	0.0	0	0	10.9	8.3	0.2	0.2	0	13.5	4.9	0	10.0	0.0	0.7	2.3	8.7	13.0
10-11	2.8	0	0	16.7	11.0	0.2	0.1	0	12.8	3.9	0	9.3	0.0	0.5	2.8	11.3	12.6
11-12	8.7	0	0	23.3	16.2	0.2	0.1	0	4.4	2.1	0	3.2	0.0	0.2	0.1	16.5	3.5
12-13	14.0	0	0	38.3	26.6	0.2	0.1	0	7.5	5.1	0	6.1	0.0	0.3	0.0	26.9	6.4
13-14	5.5	0	0	30.3	21.2	0.2	0.1	0	8.9	6.6	0	8.7	0.0	0.4	0.1	21.5	9.2
14-15	2.3	0	0	34.5	20.2	0.2	0.1	0	3.6	2.7	0	3.7	0.0	0.2	0.1	20.5	3.5

LAX - STAGE 1

EXPERIMENT NO. 12

Objective:

To assess delays to aircraft in 1982 for the following runway configuration in IFR 1 with an improved ATC system scenario (1982) and the 1982 near-term improvements.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25R, 25L	24L, 25R

Related Comparison Experiments:

Prior Experiment #8 is similar except for the noted improvements and a 1978 ATC system scenario.

TABLE 12

SUMMARY OF RESULTS

EXPERIMENT NO. 12 (MODIFIED DEMAND)

TIME	AVERAGE FLOW RATES													AVERAGE TRAVEL TIME		
	ARRIVALS							DEPARTURES								
	RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
7-8	4.0	0.0	0.0	22.0	26.0	25	+1.0	0.0	15.0	26.0	0.0	41.0	48	-7.0	10.5	4.2	6.3
8-9	20.0	0.0	0.0	23.5	43.5	45	-1.5	0.0	16.2	38.5	0.0	54.7	64	-1.3	13.6	4.8	15.0
9-10	8.0	0.0	0.0	23.8	31.8	41	-9.2	0.0	27.3	32.2	0.0	65.0	54	+11.0	19.7	4.3	13.2
10-11	22.2	0.0	0.0	28.3	50.5	53	-2.5	0.0	15.0	31.1	0.0	46.1	48	-1.9	23.0	4.7	12.0
11-12	25.0	0.0	0.0	31.0	56.8	62	-5.2	0.0	18.0	31.8	0.0	49.9	52	-2.3	29.4	4.7	7.6
12-13	25.0	0.0	0.0	23.9	48.9	44	+4.9	0.0	16.9	38.0	0.0	54.9	65	-10.1	29.5	4.2	13.4
13-14	11.1	0.0	0.0	24.2	35.3	40	-4.7	0.0	21.1	36.6	0.0	57.7	54	+3.7	34.4	4.5	17.6
14-15	21.9	0.0	0.0	29.5	51.4	53	-1.6	0.0	10.8	33.7	0.0	44.5	41	+3.5	30.8	4.6	10.0

TIME	ARRIVAL DELAYS AVERAGE							DEPARTURE DELAYS AVERAGE							GRAND TOTAL		
	RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-IN	RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-OUT	RWY CONG.	ARR. DELAY	DEP. DELAY
7-8	0.0	0.0	0.0	2.1	2.0	0.1	0.3	0.0	0.1	1.6	0.0	1.1	0.0	0.2	0.0	2.4	1.3
8-9	1.2	0.0	0.0	6.5	4.1	0.1	0.3	0.0	1.0	7.1	0.0	6.9	0.2	0.5	0.2	4.5	7.6
9-10	0.0	0.0	0.0	13.6	10.1	0.2	0.2	0.0	2.3	10.5	0.0	7.1	0.0	0.5	0.5	10.5	8.1
10-11	1.3	0.0	0.0	21.9	13.2	0.1	0.1	0.0	1.9	8.1	0.0	6.1	0.0	0.6	0.3	12.4	7.0
11-12	1.3	0.0	0.0	20.5	11.5	0.1	0.1	0.0	1.8	2.7	0.0	2.2	0.0	0.2	0.0	14.7	2.4
12-13	3.1	0.0	0.0	38.5	20.7	0.1	0.2	0.0	1.1	10.5	0.0	7.2	0.0	0.7	1.0	20.7	9.0
13-14	0.3	0.0	0.0	31.1	25.5	0.2	0.1	0.0	2.0	11.9	0.0	8.5	0.0	0.1	1.1	25.8	9.3
14-15	1.0	0.0	0.0	26.3	21.6	0.1	0.1	0.0	0.1	5.1	0.0	4.0	0.0	0.2	0.1	21.8	4.9

TABLE 13

SUMMARY OF RESULTS

EXPERIMENT NO. 12 (MODIFIED DEMAND)
(REROUTED DEPARTURES TO 24L)

TIME	AVERAGE FLOW RATES														AVERAGE TRAVEL TIME		
	ARRIVALS							DEPARTURES									
	RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	RWY 24R	RWY 24L	RWY 25R	RWY 25L	AVG. TOTAL FLOW	DE-MAND	DIFF.	FIX TO THRESH.	THRESH. TO GATE	GATE TO ROLL
7-8	4.0	0	0	22.0	26.0	25	+1.0	0	15.0	26.0	0	41.0	48	-7.0	10.5	4.2	6.3
8-9	20.0	0	0	24.9	44.9	45	-0.1	0	25.2	30.3	0	55.4	64	-8.6	12.4	4.7	14.2
9-10	8.0	0	0	27.0	35.0	41	-6.0	0	34.7	27.2	0	61.9	54	+7.9	16.6	4.2	15.7
10-11	22.0	0	0	30.6	52.6	53	-0.4	0	26.3	24.2	0	50.5	48	+2.5	17.2	4.7	13.5
11-12	25.9	0	0	30.7	56.6	62	-5.4	0	18.9	30.2	0	49.1	52	-2.9	17.7	4.7	8.3
12-13	24.6	0	0	29.0	53.6	44	+9.6	0	28.6	27.4	0	56.2	65	-8.8	22.0	4.8	14.9
13-14	11.5	0	0	27.7	39.2	40	-0.8	0	34.0	24.6	0	58.6	54	+4.6	12.1	4.6	17.2
14-15	22.0	0	0	30.5	52.5	53	-0.5	0	16.7	29.8	0	46.5	41	+5.5	14.0	4.7	10.6

TIME	ARRIVAL DELAYS AVERAGE							DEPARTURE DELAYS AVERAGE								GRAND TOTAL	
	RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-IN	RWY 24R	RWY 24L	RWY 25R	RWY 25L	ALL RWY	RWY CROSS	TAXI-OUT	RWY CONG.	ARR. DELAY	DEP. DELAY
7-8	0.0	0.0	0.0	2.3	2.0	0.1	0.2	0.0	0.1	1.6	0.0	1.1	0.0	0.2	0.0	2.3	1.3
8-9	1.9	0.0	0.0	3.5	2.8	0.2	0.2	0.0	9.8	5.8	0.0	7.6	0.0	0.5	0.5	3.2	8.6
9-10	0	0.0	0.0	9.2	7.1	0.2	0.2	0.0	11.7	4.3	0.0	8.4	0.0	0.7	1.2	7.4	10.4
10-11	1.6	0.0	0.0	11.4	7.3	0.1	0.1	0.0	7.4	5.1	0.0	6.1	0	0.6	1.1	7.5	8.1
11-12	1.4	0.0	0.0	13.5	8.0	0.2	0.1	0.0	2.4	3.1	0.0	2.8	0.0	0.2	0.0	8.2	3.1
12-13	7.3	0.2	0.1	12.9	13.1	0.2	0.1	0.0	11.1	6.0	0.0	8.5	0.0	0.3	0.3	15.4	9.2
13-14	1.2	0.0	0.0	3.5	2.9	0.2	0.1	0.0	13.1	5.5	0.0	9.9	0.0	0.5	1.3	3.7	11.7
14-15	1.4	0.0	0.0	7.1	4.7	0.2	0.1	0.0	5.3	3.2	0.0	4.3	0.0	0.4	0.7	5.0	5.4

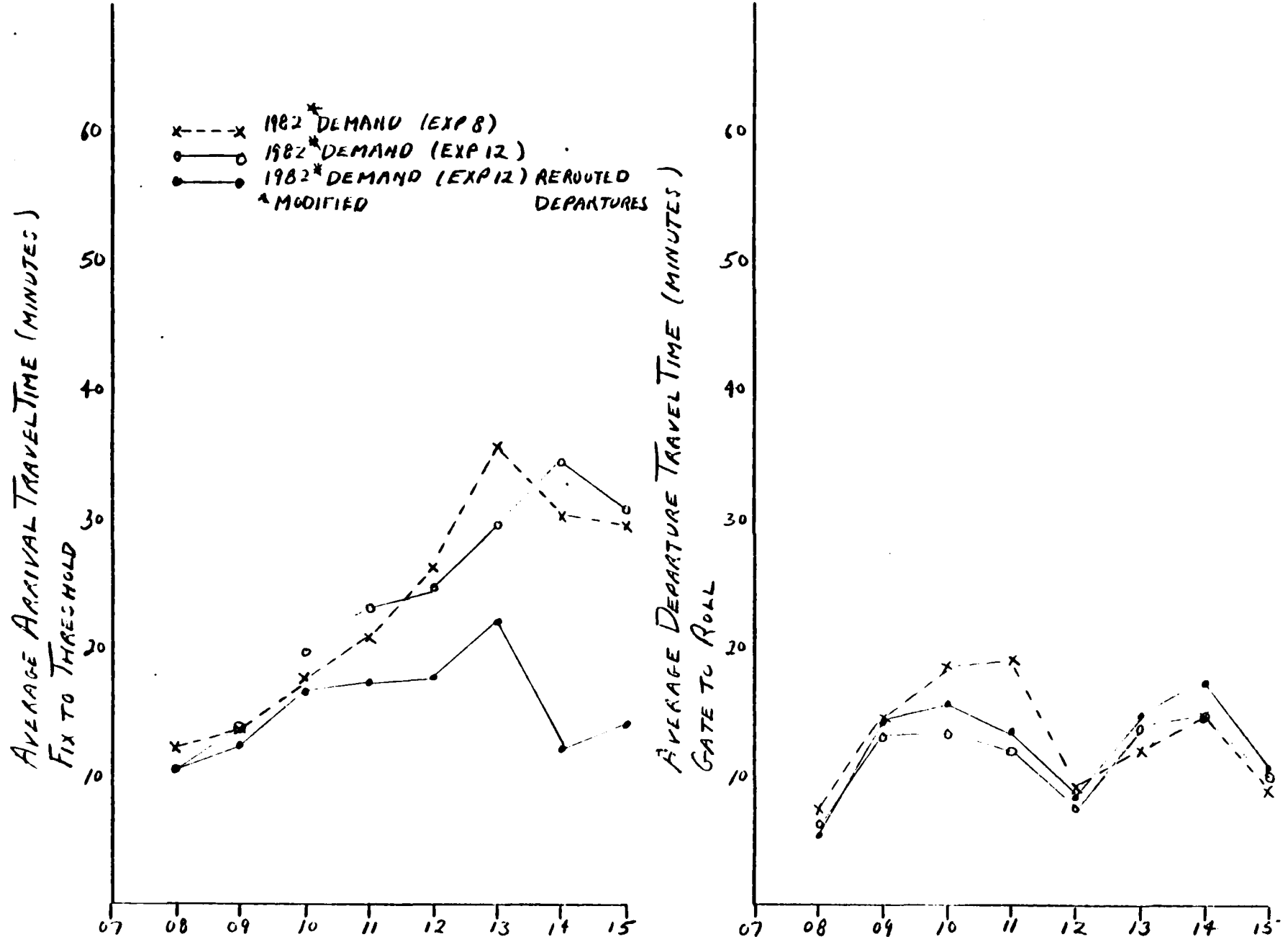

FIGURE 6 IFR (1975 AND 1982) COMPARISON - WESTERLY FLOW

ATTACHMENT D

LOS ANGELES STAGE 2 DELAY EXPERIMENTS

LOS ANGELES INTERNATIONAL AIRPORT

AIRPORT IMPROVEMENT TASK FORCE DELAY STUDIES

TABLE 14

LOS ANGELES DELAY EXPERIMENTS

Experiment number	Model	Study case[a]	Arrival runways	Departure runways	Weather	Demand	ATC System scenario[b]	Near Tearm[c] improvements
Stage I Experiments								
1	ASM[d]	1	24L, 24R, 25L, 25R	24L, 24R, 25L, 25R	VFR1	1978	1978	None
2	ASM	2	24L, 24R, 25L, 25R	24L, 25R	IFR1	1978	1978	None
3	ASM	3	24R, 25L	24L, 25R	IFR2	1978	1978	None
4	ASM	5	6R, 7L	24L, 25R	VFR1	1978	1978	None
5	ASM	6	6R, 7L	24L, 25R	IFR1	1978	1978	None
6	ASM	4	6L, 6R, 7L, 7R	6L, 6R, 7L, 7R	VFR1	1978	1978	None
7 (7A) (7B)	ASM	1	24L, 24R, 25L, 25R	24L, 24R, 25L, 25R	VFR1	1982 (+5%) (+15%)	1978	None
8 (8A) (8B)	ASM	2	24L, 24R, 25L, 25R	24L, 25R	IFR1	1982 (+5%) (+15%)	1978	None
9	ASM	4	6L, 6R, 7L, 7R	6L, 6R, 7L, 7R	VFR1	1982	1978	None
10	ASM	5	6R, 7L	24L, 25R	VFR1	1982	1978	None
10A	ASM	6	6R, 7L	24L, 25R	IFR1	1982	1978	None[e]
11	ASM	1	24L, 24R, 25L, 25R	24L, 24R, 25L, 25R	VFR1	1982	1982	1982[f]
12	ASM	2	24L, 24R, 25L, 25R	24L, 25R	IFR1	1982	1982	1982[f]
13	ASM	1	24L, 24R, 25L, 25R	24L, 24R, 25L, 25R	VFR1	1982	1982	2, 3[f]
15	ASM	5	6R, 7L	24L, 25R	VFR1	1982	1982	5, 7[g]
16	ASM[h]	4	6L, 6R, 7L, 7R	6L, 6R, 7L, 7R	VFR1	1982	1982	5, 7, 8[g]
17	ADM[h]	n.a.	n.a.	n.a.	n.a.	1978	1978	None
17A	RCM[i]	7	24L, 24R, 25L	24L, 24R, 25L	VFR1	1982	1982	Tunnel Construction[j]
17B	RCM	7	24L, 24R, 25L, 25x[k]	24L, 24R, 25L, 25X	VFR1	1982	1982	Tunnel Construction
17C	RCM	7	24L, 24R, 25L, 26	24L, 24R, 25L, 26	VFR1	1982	1982	Comments-Usage for Light

n.a. = not applicable.

a. Study cases (combinations of runway use and weather conditions) are defined in Figure III-1.

b. FAA will describe impact of 1982 and post-1987 ATC systems on model inputs.

c. Potential near-term improvements are identified in the Los Angeles International Airport Improvement Task Force Interim Report, and in Appendix B.

d. Airfield Simulation Model.

e. Task Force establishes packages of near-term improvements most likely to be implemented in 1982 and 1987 time frames. The 1982 package includes improvement # 2 (high-speed taxiway off Runway 25L to the south), improvement # 3 (strengthening of the Sepulveda Tunnel), (cont.)

TABLE 14 (CONTINUED)

e. (cont.) new taxiway access to threshold of Runway 24R, and temporary holding areas on future Taxiway 75. The 1987 package includes all 1982 improvements plus Satellite 1, International Terminal, and/or remote parking for 20 aircraft at west end of airport. These packages of improvements are subject to Task Force review and revision.
f. Impact of absence of Improvements # 2 and #3 (high-speed taxiway of Runway 25L and strengthening of the Sepulveda Tunnel).
g. Improvement # 5 is a high-speed taxi exit off Runway 7. Improvement # 7 is a high-spped taxi exit to Taxiway 47 from Runway 6R. Improvement #8 is a bypass area on the north side of Runway 7L.
h. Annual Delay Model.
i. Runway Capacity Model.
j. Runway 25R closed for tunnel construction.
k. During closure of 25R for tunnel construction, parts of Runway 25 are open for small aircraft arrivals and departures.

TABLE 14

LOS ANGELES DELAY EXPERIMENTS

Experiment number	Model	Study case[a]	Arrival Runways	Departure Runways	Weather	Demand	ATC System scenario[b]	Near-term improvements[c]
Stage 2 Experiments								
18	ASM	1	24L, 24R, 25L, 25R	24L, 24R, 25L, 25R	VFR1	1982	1982	10[l]
19 A	ASM	1	24L, 24R, 25L, 25R	24L, 24R, 25L, 25R	VFR1	1982	1978	Terminal Expansion[n]
20	ASM	1	24L, 24R, 25L, 25R	24L, 24R, 25L, 25R	VFR1	1982	1982	Terminal Expansion[n]
21	ASM	1	24L, 24R, 25L, 25R	24L, 24R, 25L, 25R	VFR1	1982	1982	Remote Terminal [o]
22	ASM	7	24L, 24R, 25L	24L, 24R, 25L	VFR1	1982	1978	Tunnel Construction
22A	ASM	8	24L, 24R, 25L	24L, 24R, 25L	VFR1	1982	1978	Dual Taxiway[p]
23	ASM	8	24R, 25L	24L, 25L	IFR1	1982	1978	Tunnel Construction 25R
24	ASM	9	24R, 25R	24L, 25R	IFR1	1982	1978	Tunnel Construction 25L
25	ASM	1	24L, 24R, 25L, 25R	24L, 24R, 25L, 25R	VFR1	1987	1987	1987[e]
25A	ASM	1	24L, 24R, 25L, 25R	24L, 24R, 25L, 25R	VFR1	1987	1987	1987
26	ASM	2	24L, 24R, 25L, 25R	24L, 24R	IFR1	1987	1987	1987
27	ADM	n.a.	n.a.	n.a.	n.a.	1982	1982	1982
28	ADM	n.a.	n.a.	n.a.	n.a.	1982	1982	None
29	ADM	n.a.	n.a.	n.a.	n.a.	1982	1978	1982
30	ADM	n.a.	n.a.	n.a.	n.a.	1982	1978	None
31	ADM	n.a.	n.a.	n.a.	n.a.	1987	1987	1987
32	ADM	n.a.	n.a.	n.a.	n.a.	1987	1987	None
33	ADM	n.a.	n.a.	n.a.	n.a.	1987	1978	1987
34	ADM	n.a.	n.a.	n.a.	n.a.	1987	1988	None

l. Improvement #10 consists of a series of taxiway improvements identified in Appendix B.

n. Construction of Satellite 1 and International Terminal. The need for this experiment will be reviewed by the Task Force after consideration of future airline terminal locations.

o. Remote parking for 20 aircraft at west end of Airport.

p. Additional experiment may be needed to test value of dual taxiway system around Satellite 4 during tunnel construction

LAX - STAGE 2

EXPERIMENT NO. 18

Objective:

To assess delays to aircraft in 1982 for the following runway configuration in VFR 1 with an improved ATC system scenario (1982) and improvement #10 (taxiways).

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25R, 25L	24R, 24L, 25R, 25L

Related Comparison Experiments:

Prior Experiment #11 is identical except for improvement #10 (taxiway improvements).

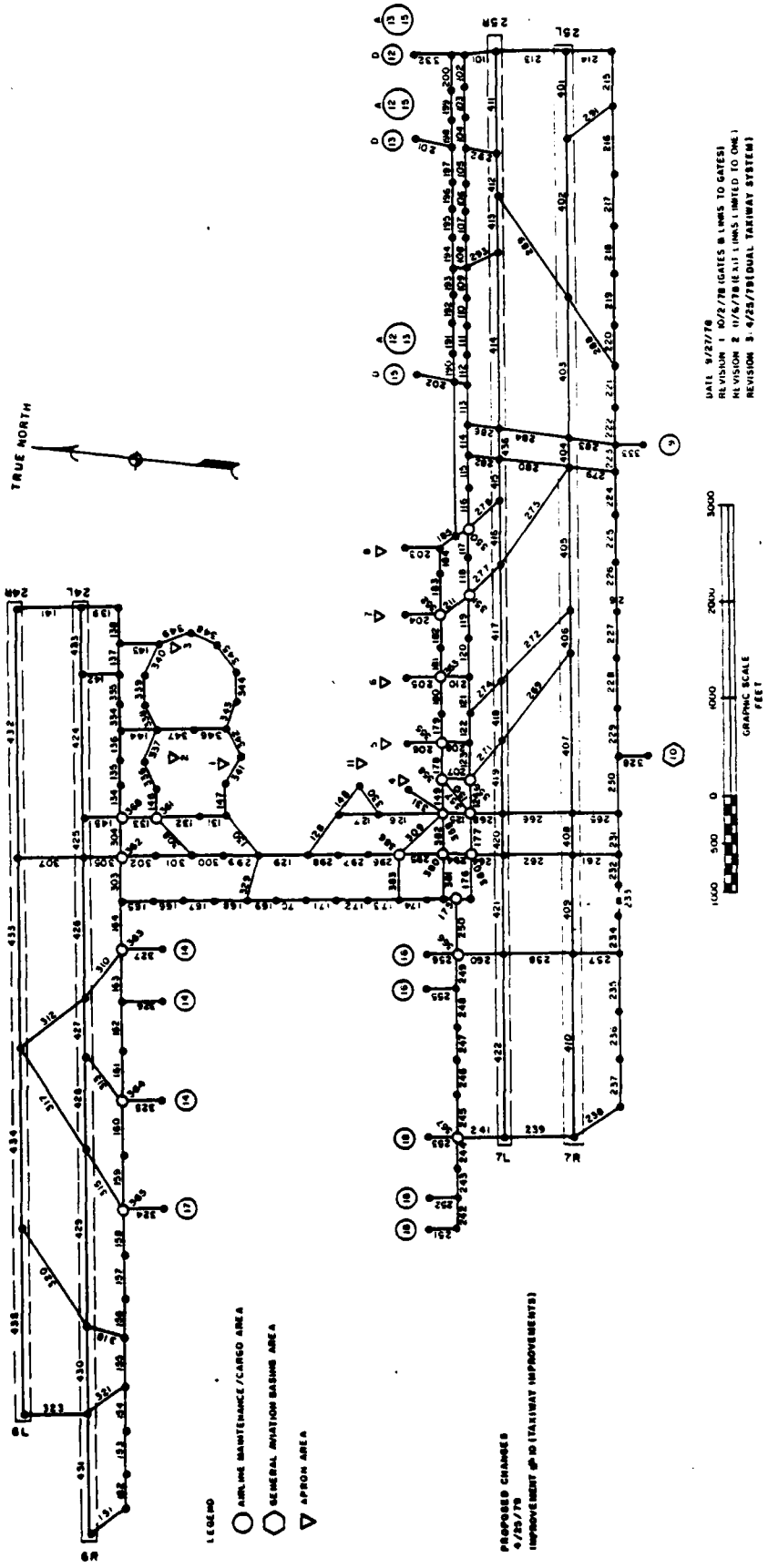

Figure 15 LAX LINK NODE DIAGRAM (DUAL TAXIWAY)

LAX - STAGE 2

EXPERIMENT NO. 19A

Objective:

To assess delays to aircraft in 1982 for the following runway configuration in VFR 1 with terminal expansion.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25R, 25L	24R, 24L, 25R, 25L

Related Comparison Experiments:

Experiment #20 is identical except for an improved ATC system scenario.

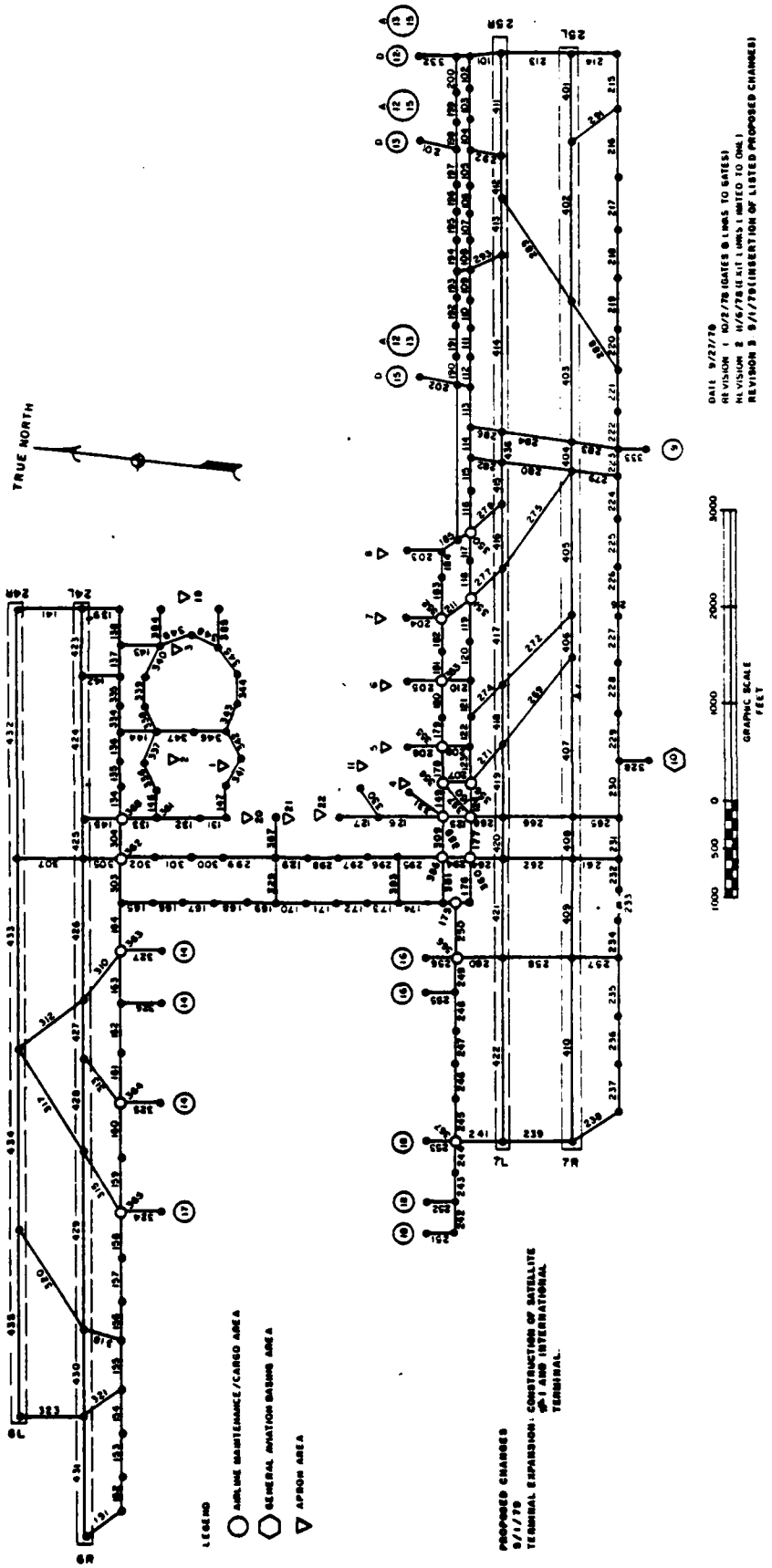

Figure 16 LAX LINK NODE DIAGRAM (TERMINAL EXPANSION)

LAX - STAGE 2

EXPERIMENT NO. 20

Objective:

To assess delays to aircraft in 1982 for the following runway configuration in VFR 1 with an improved ATC system scenario and terminal expansion.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25R, 25L	24R, 24L, 25R, 25L

Related Comparison Experiments:

Experiment #21 is identical except for remote parking for 20 aircraft at west end of airport in place of terminal expansion.

Prior Experiment #19A is identical except for a 1978 ATC system scenario

LAX - STAGE 2

EXPERIMENT NO. 21

Objective:

To assess delays to aircraft in 1982 for the following runway configuration in VFR 1 with an improved ATC system scenario and remote parking for 20 aircraft.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25R, 25L	24R, 24L, 25R, 25L

Related Comparison Experiments:

Prior Experiment #20 is identical except for remote parking for 20 aircraft at west end of airport in place of terminal expansion.

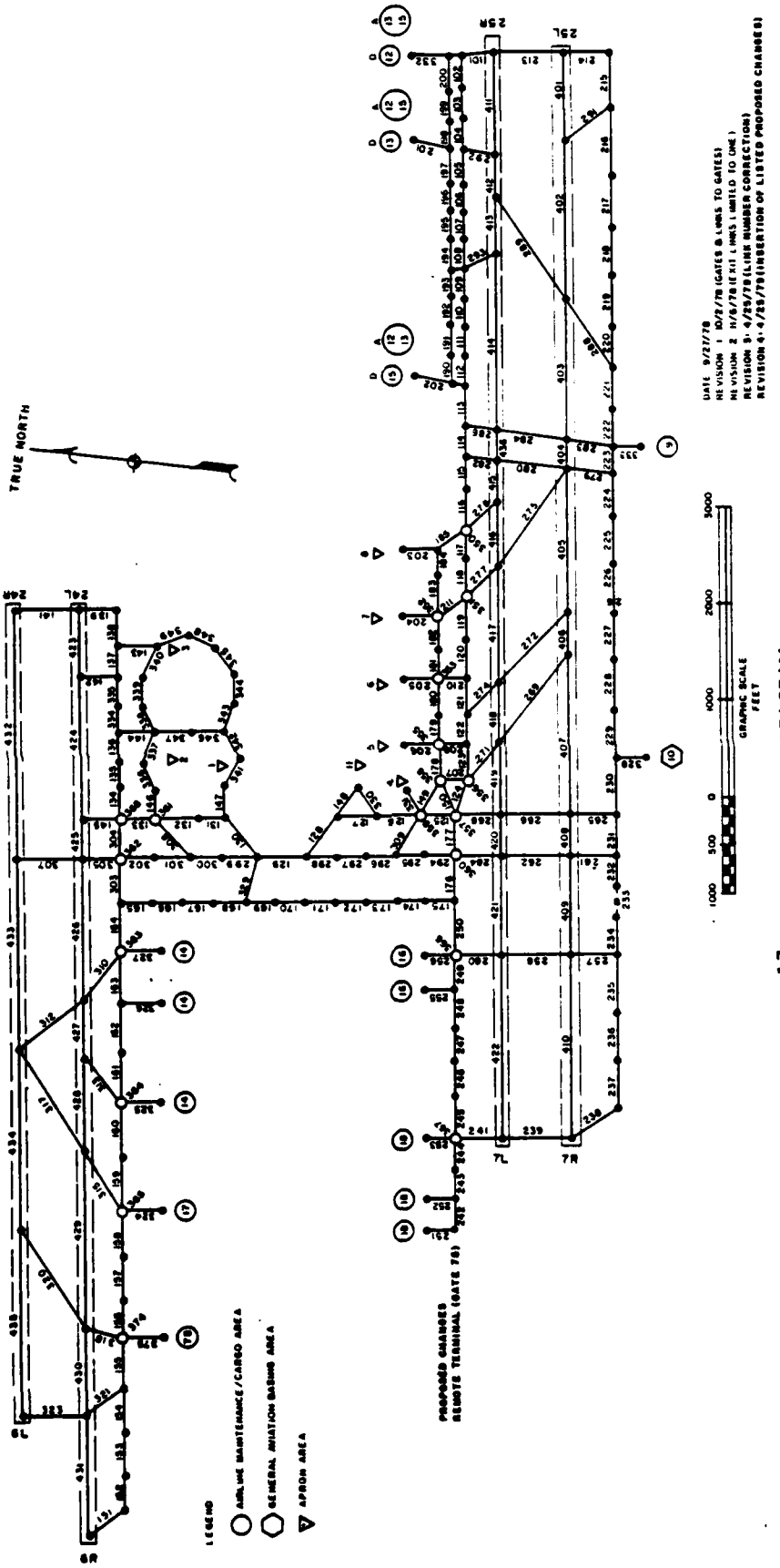

Figure 17 LAX LINK NODE DIAGRAM
(REMOTE TERMINAL)

LAX - STAGE 2

EXPERIMENT NO. 22

Objective:

To assess the delay impact to aircraft in (1982) for the following runway configuration in VFR 1 due to the runway closure of 25R during work on the Spulveda Tunnel.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25L	24R, 24L, 25L

Related Comparison Experiments:

Prior Experiment #1 is identical except for closure of 25R for tunnel construction and a 1978 demand.

LAX - STAGE 2

EXPERIMENT NO. 22A

Objective:

To assess the delay impact to aircraft in 1982 for the following runway configuration in VFR 1 due to the runway closure of 25R during work on the Sepulveda Tunnel with a dual taxiway system around satellite 4.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24L, 24R, 25L	24L, 24R, 25L

Related Comparison Experiments:

Prior Experiment #22 is identical except for a dual taxiway system

LAX - STAGE 2

EXPERIMENT NO. 23

Objective:

To assess the delay impact to aircraft in (1982) for the following runway configuration in IFR 1 due to the runway closure of 25R during work on the Sepulveda Tunnel.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 25L	24L, 25L

Related Comparison Experiments:

Prior experiment #2 is identical except for the closure of runway 25R for tunnel construction and a 1978 demand.

LAX - STAGE 2

EXPERIMENT NO. 25 (25A)

Objective:

To assess delays to aircraft in 1987 for the following runway configuration in VFR 1 with an improved 1987 ATC system scenario and 1982 improvements plus the satellite terminal and/or remote parking for 20 aircraft (1987 improvement package). Experiment #25A is with greater peaks.

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25R, 25L	24R, 24L, 25R, 25L

Related Comparison Experiments:

Prior Experiment #11 is identical except for the improvements from 1982 to 1987 and the 1987 demand.

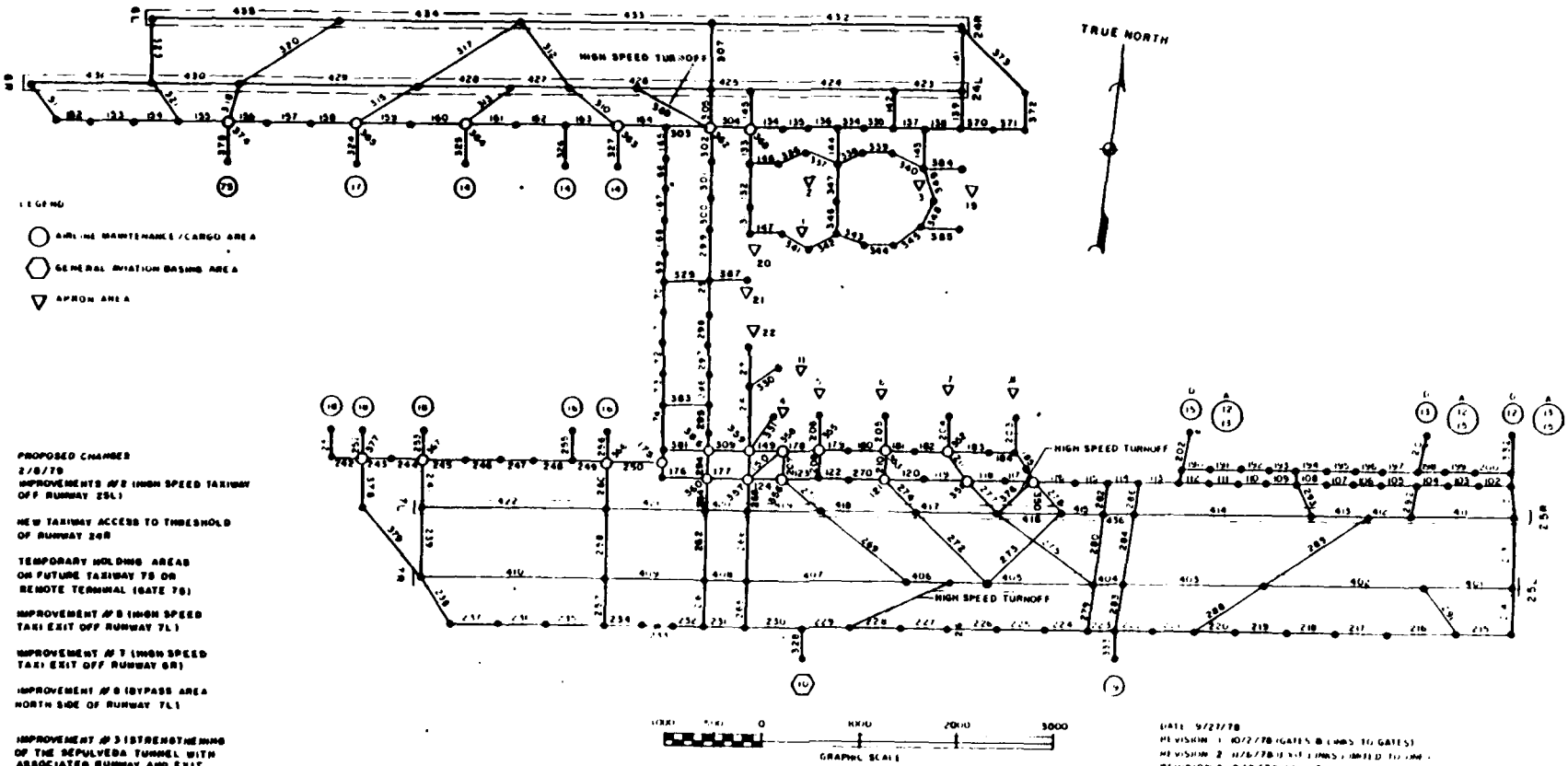

Figure 18 LAX LINK NODE DIAGRAM (COMBINED IMPROVEMENTS)

LAX - STAGE 2

EXPERIMENT NO. 24

Objective:

To assess the delay impact to aircraft in 1982 for the following runway configuration in IFR 1 due to the runway closure of 25L during work on the Sepulveda Tunnel

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 25R	24L, 25R

Related Comparison Experiments:

Prior Experiment #2 is identical except for the closure of runway 25L for tunnel construction and a 1978 demand.

LAX - STAGE 2

EXPERIMENT NO. 26

Objective:

To assess delays to aircraft in 1987 for the following runway configuration in IFR 1 with an improved 1987 ATC system scenario and 1982 improvements plus the satellite terminal and/or remote parking for 20 aircraft.(1987 improvement package).

ARRIVAL RUNWAYS	DEPARTURE RUNWAYS
24R, 24L, 25R, 25L	24L, 25R

Related Comparison Experiments:

Prior Experiment #12 is identical except for the improvements from 1982 to 1987 and the demand.(1987)


DATE:
ILME